US 20210406541A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2021/0406541 A1**

Ulbricht et al. (43) **Pub. Date: Dec. 30, 2021**

(54) **PLANE DETECTION USING SEMANTIC SEGMENTATION**

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Daniel Ulbricht**, Sunnyvale, CA (US); **Angela Blechschmidt**, San Jose, CA (US); **Mohammad Haris Baig**, San Jose, CA (US); **Tanmay Batra**, Mountain View, CA (US); **Eshan Verma**, Mountain View, CA (US); **Amit Kumar KC**, Sunnyvale, CA (US)

(21) Appl. No.: **17/473,469**

(22) Filed: **Sep. 13, 2021**

Related U.S. Application Data

(63) Continuation of application No. 17/032,213, filed on Sep. 25, 2020, now Pat. No. 11,132,546, which is a continuation of application No. 16/360,732, filed on Mar. 21, 2019, now Pat. No. 10,824,864.

(60) Provisional application No. 62/689,474, filed on Jun. 25, 2018.

Publication Classification

(51) **Int. Cl.**

G06K 9/00	(2006.01)
G06K 9/62	(2006.01)
G06K 9/72	(2006.01)
G06T 19/00	(2006.01)
G06T 7/70	(2006.01)

(52) **U.S. Cl.**

CPC ***G06K 9/00664*** (2013.01); ***G06K 9/6267*** (2013.01); ***G06K 9/726*** (2013.01); *G06T 2207/20084* (2013.01); ***G06T 7/70*** (2017.01); *G06T 2200/24* (2013.01); *G06T 2207/10028* (2013.01); ***G06T 19/006*** (2013.01)

(57) **ABSTRACT**

In one implementation, a method of generating a plane hypothesis is performed by a device including one or more processors, non-transitory memory, and a scene camera. The method includes obtaining an image of a scene including a plurality of pixels. The method includes obtaining a plurality of points of a point cloud based on the image of the scene. The method includes obtaining an object classification set based on the image of the scene. Each element of the object classification set includes a plurality of pixels respectively associated with a corresponding object in the scene. The method includes detecting a plane within the scene by identifying a subset of the plurality of points of the point cloud that correspond to a particular element of the object classification set.